UNITED NATIONS

Framework Convention on Climate Change

Distr.
GENERAL

FCCC/SBSTA/1996/4
2 February 1996

Original: ENGLISH

SUBSIDIARY BODY FOR SCIENTIFIC AND TECHNOLOGICAL ADVICE
Second session
Geneva, 27 February - 4 March 1996
Item 7 of the provisional agenda

TECHNOLOGY INVENTORY AND ASSESSMENT

Initial report on an inventory and assessment of technologies to mitigate and adapt to climate change

Note by the secretariat

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I. INTRODUCTION

A. Mandate

1. At its first session, the Conference of the Parties (COP) by its decision 13/CP.1 on transfer of technology, requested the Convention secretariat "to prepare an inventory and assessment of environmentally sound and economically viable technologies and know-how conducive to mitigating and adapting to climate change. This inventory should also include an elaboration of the terms under which transfers of such technologies and know-how could take place" (FCCC/CP/1995/7/Add.1).

2. The COP further requested the secretariat "to submit the documents ... through the Subsidiary Body for Scientific and Technological Advice, to the Conference of the Parties at its second session, and to update them at regular intervals (each interval not to exceed a year) for consideration by the Conference of the Parties at each of its sessions; [and] to take the advice of the Subsidiary Body for Scientific and Technological Advice ... in implementing these responsibilities and to coordinate this matter with the relevant United Nations agencies and other organizations and institutions" (FCCC/CP/1995/7/Add.1).

3. Furthermore, the Ad Hoc Group on the Berlin Mandate (AGBM), at its first session, requested the Subsidiary Body for Scientific and Technological Advice (SBSTA) "to provide, for consideration at its third session (4-8 March 1996), a report on innovative, efficient and state-of-the-art technologies and know-how that could advance the implementation of the Berlin Mandate. This should be periodically updated" (FCCC/AGBM/1995/2, para. 19 (l)).

4. The SBSTA took note of the requests for inputs from the AGBM and requested the secretariat "to prepare ... an initial progress report relating to technology identification, assessment and development, as well as an inventory of state-of-the-art, environmentally sound and economically viable technologies and know-how conducive to mitigating and adapting to climate change, in implementation of decision 13/CP.1" (FCCC/SBSTA/1995/3, para. 26).

B. Scope of the note

5. This note contains information on the action taken so far by the secretariat to prepare an inventory and assessment of technologies. It identifies the main question, "What type of information on technologies and know-how would be most useful to the Parties?", and seeks guidance on a number of issues related to this question, as well as describing further work to be undertaken. The term "technologies and know-how", as used in this report, encompasses 'soft technologies' and 'hard technologies'. Examples of 'soft' technologies include capacity building, information networks, training, and research, while examples of 'hard' technologies include equipment and products to control, reduce or prevent anthropogenic emissions of greenhouse gases in the energy, transportation, forestry, agriculture, and industry sectors, to enhance removals by sinks, and facilitate adaptation.

6. In this context, the secretariat notes that the language in decision 13/CP.1 and the request of the AGBM differ: the former uses the words "environmentally sound and economically viable" and the latter uses the words "innovative, efficient, and state-of-the-art". This initial report has been prepared to address both requests.

7. A discussion of the transfer of technology by Annex II Parties may be found in FCCC/1996/SBI/5 and a discussion of the guidelines for the preparation of first communications may be found in FCCC/1996/SBSTA/3.

C. Action by the Subsidiary Body for Scientific and Technological Advice

8. The SBSTA may wish to note the activities of the secretariat and consider the issues raised in this report, particularly the priority for future work. It may also wish to transmit its conclusions to the AGBM.

II. STEPS IN THE PREPARATION OF THE PRESENT REPORT

9. As its first step, the secretariat sent a letter to the 145 Parties to the Convention and 42 relevant United Nations bodies and intergovernmental organizations on 13 November 1995, requesting copies of reports summarizing information on mitigation and adaptation technologies by sectors or categories rather than detailed reports on specific technologies. As a guide, the letters contained a list of mitigation technologies provided by the Intergovernmental Panel on Climate Change (IPCC) in its Second Assessment Report, chapter 28, "Inventory of technologies, methods, and practices for reducing emissions of greenhouse gases" (FCCC/SBSTA/1996/7/Add.2).

10. Secondly, the secretariat drew upon many activities already under way in relevant United Nations agencies and other bodies. For example, it utilized the "Survey of information systems related to environmentally sound technologies" prepared by the United Nations Environment Programme (UNEP) in April 1995. The survey identifies 51 institutions that operate information systems on environmentally sound technologies, many related to climate change issues. Thirty-three of the institutions that were likely to have information on mitigation and adaptation technologies and know-how, as referred to in decision 13/CP.1, were contacted. In addition, the secretariat expanded collaboration with

the United Nations Industrial Development Organization (UNIDO) which has an information system and experience with industrial processes in developing countries. The secretariat also used the Internet* to begin searching for additional on-line information sources.

11. Finally, the secretariat designed a database to organize the information received from contributing Parties, specialized agencies and other bodies of the United Nations system, intergovernmental organizations, and other institutions and organizations. It contains written materials, technical reports, journal articles, books, and reports on conferences and workshops. In addition, information is available on institutions, information centres, databases, and "web sites" which disseminate information on mitigation and adaptation technologies.

12. For illustrative purposes, the contents of the database are reproduced in the addendum to this document (see FCCC/SBSTA/1996/Add.1) and arranged according to the contributing entity, that is, contributing Parties, United Nations Secretariat units and other bodies, specialized agencies and other organizations of the United Nations system, intergovernmental organizations, and other institutions and organizations. The structure comprises the report title, issuing organization, an abstract of the content, intended users, types of technologies considered, access, and price. The database is still in a preliminary stage and can be expanded and adapted to meet specific needs. In the future, records could be sorted by different categories and searches undertaken.

III. GENERAL RESULTS CONCERNING SOURCES OF INFORMATION

13. The secretariat received 31 responses from Parties and intergovernmental organizations to its request for information by 15 January 1996. In addition, it received seven responses to inquiries made via electronic means. Four Parties acknowledged the letter, but did not provide specific information and are therefore not represented in the database.

14. The information forwarded to the secretariat revealed that a large number of technologies are either currently being developed or are in use. This information is available via:

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* The Internet was developed to enable researchers to transfer information electronically. Since then it has become a world-wide network through which texts, images and personal messages are exchanged electronically over long distances almost immediately. It is growing rapidly and now has some 40 million users in the world of which about half are in North America. The World Wide Web, one service of the Internet, is a tool to make information publicly available. Organizations, institutions, companies, and individuals establish "home pages" and "web sites" to enable users to access information (some free of charge and others for a fee). In some countries, the high cost to users of being connected to the Internet, insufficient telecommunication infrastructure and other factors, may currently limit access to Internet.

(a) Written materials. Journal articles, technical reports, books, and newsletters (such as the International Energy Agency/Organisation for Economic Co-operation and Development (IEA/OECD)) study "Energy and environmental technologies to respond to global climate change concerns");

(b) Databases. Information stored in computerized databases, which can be obtained on diskette or accessed on-line. In addition, a hard copy of information contained in the database is often available upon request (for example, *The Greenhouse Gas Technology Information Exchange (GREENTIE) Directory* listing 3000 research institutions and technology suppliers);

(c) Workshops and training courses. Some institutions conduct workshops and training programmes on specific technologies (for example, the training courses on environmental information services conducted by the Environmental Systems Information Centre (ENSIC), Bangkok.).

15. The type of information available on technologies varies considerably. For illustrative purposes, table 1 below gives selected examples of different types of reports. However, in many cases it is difficult to categorize a report since the contents address several subject areas.

TABLE 1. EXAMPLES OF DIFFERENT TYPES OF REPORTS

Content	Description	Example
Research and development projects	A description of laboratory, bench scale or other experiments	"Solar thermal power and solar chemical systems", SolarPACES, IEA, 1994
Demonstration projects	A description of technology or practices tested on a small or limited scale	"Photovoltaics provide electricity to rural communities in the Philippines", Centre for the Analysis and Dissemination of Demonstrated Energy Technologies (CADDET), 1995
Product description	A catalogue of technical information and prices for specific products	"The Australian renewable energy industry", Department of Primary Industries and Energy, Australia, 1993
Multiple technology assessment	A comparative analysis of the performance, environmental impacts, and cost of several technologies or practices	"Options for reducing methane emissions internationally, vol. 1: technology options", United States Environmental Protection Agency, 1993
Programme report	The results of a programme conducted over a number of years to develop or introduce a technology or process in a country or region	"Implementation programme: reduction of environmental impact from coal in Central/Eastern Europe", United Nations Development Programme (UNDP), 1995
Case study	A summary of the technical, financial, institutional, and other aspects associated with deploying a new technology in a country or region	"Local and regional energy-related environmental issues", World Energy Council (WEC), 1995
Cost-effectiveness study	A study of the costs of different technologies	"Renewable energy technologies: a review of the status and cost of selected technologies", World Bank, 1994
Government policy report	An integrated report on policies, measures, and technologies	"Energy management in Africa", African Energy Policy Research Network (AFREPREN), 1992
Bibliography	A description and identification of reports, date of issue, and authorship	"Energy conservation in industry", Industrial and Technological Information Bank (INTIB), United Nations Industrial Development Organization (UNIDO), 1994
Institutional directory	A list of organizations working on a particular technology	*International Directory of Energy Efficiency Institutions*, World Energy Efficiency Association (WEEA), 1995

16. Three examples are described below in more detail:

(a) The "Inventory of technologies, methods, and practices for reducing emissions of greenhouse gases", chapter 28 of the IPCC Second Assessment Report provides specific data on 105 mitigation technology options, such as, technical and environmental

characteristics, cost, implementation requirements, and references. The major objective of this inventory is to provide a data source on energy supply and end-use technologies, as well as on industrial, agricultural and forestry practices. Furthermore, it provides a common format for documenting and exchanging technical, economic and operational data on various technology systems. It does not include adaptation technologies;

(b) The "Survey of information systems related to environmentally sound technologies" prepared by UNEP in April 1995 identified 51 information systems providing information on environmentally sound technologies, many of which are applicable to climate change issues. Expert meetings and a further assessment of user needs will contribute to a new version of the survey report in April 1996. A database and catalogue of information systems relating to environmentally sound technology will become available on diskette and/or the Internet in the future;

(c) The IEA/OECD *Greenhouse Gas Technology Information Exchange (GREENTIE) Directory* is intended to facilitate the transfer of greenhouse gas technology, in line with the IPCC list of 105 technologies. It has established and maintains a database of 3,000 sources of expertise on environmentally sound technologies for greenhouse gas emission reduction. GREENTIE provides an inquiry service, a printed directory, CD-ROM, and Internet access. Participating Governments pay the costs of operating the service as well as identifying national centres of expertise and submitting this information to the database.

17. The secretariat also found that the transfer of information electronically is expanding rapidly. Many Governments, intergovernmental organizations, corporations, and universities use fax machines, electronic mail (e-mail), and have "web sites" to transfer data, text, and graphics. For example, the United States Department of Energy has an Energy Efficiency and Renewable Energy "web site" that provides links to over 200 national and international "web sites". In many cases, these 200 "web sites" lead to additional sites with unprecedented amounts of information. There are therefore numerous sources of data, but it is difficult to assess the quality of the information. The simple steps taken by the secretariat in this regard are identified later in this report.

18. In preparing this report the secretariat was confronted with several challenges, including:

(a) Accessing information. As stated previously, there are many sources of information on technology and practices. In most cases the challenge is to know where to look and what to ask for. In a few cases, information was unavailable because it was out of print or could only be obtained for a fee. Almost all organizations exhibited a willingness to provide information. Many indicated that this would be made easier if the Parties decided to narrow the focus of their requests;

(b) Comparing data. The secretariat has not attempted to develop a structure for synthesizing qualitative information, a common format for assessing technologies, or a means of comparing data on specific technologies. Each of these aspects represents a different level of complexity that should reflect the needs of the Parties;

(c) Presenting information. The information collected and synthesized by the secretariat must be presented in a clear and comprehensible manner and meet the needs of all Parties. In so far as this is a new activity, the secretariat has not yet developed a structure or format for presenting information;

(d) Collecting information from non-governmental institutions. The initial letter from the secretariat requesting information on technology and practices was addressed to Parties and intergovernmental organizations. The secretariat encouraged Parties to identify information from other sources, such as universities, environmental organizations, and private sector laboratories. Although relatively little information was transmitted from non-governmental institutions to the secretariat in response to its initial letter, the secretariat nevertheless routinely receives some information directly from such sources;

(e) Adaptation technologies and practices. Little specific information has been collected on adaptation technologies and practice although the subject is treated broadly in the IPCC Second Assessment Report. This may be due to a lack of awareness in many organizations as to what constitutes an adaptation technology or practice.

IV. ISSUES THAT THE SUBSIDIARY BODY FOR SCIENTIFIC AND TECHNOLOGICAL ADVICE MAY CONSIDER

19. This initial attempt by the secretariat to inventory information on technologies and know-how conducive to mitigating and adapting to climate change demonstrates that a great deal of information is available from Parties, intergovernmental institutions, and the private sector. As discussed earlier, the current information ranges from data on specific products and vendors to case studies describing the introduction of a new technology in a country.

20. Decision 13/CP.1, while recalling the provisions of chapter 34 of Agenda 21 and the relevant provisions of the Convention, provides only broad guidance concerning the scope of such technology assessments to be undertaken by the secretariat. In order to offer more focused guidance, the SBSTA may consider several issues.

A. Objectives

21. What should be the objective(s) of future technology assessments? For example, should assessments provide information to assist developing countries in formulating and implementing national programmes to mitigate and adapt to climate change? Should assessments provide information to inform Annex I Parties about technologies that could

support a process of developing policies and measures? Or should both, and or others, be considered? In this regard, the SBSTA may wish to refer to the note prepared by the secretariat on policies and measures (FCCC/AGBM/1996/2).

B. Use of information

22. How will the information be used and by whom? Table 2 provides examples, as taken in modified form from the 1995 Second Assessment Report of the IPCC Working Group II, chapter 27, of the different levels of decision-making and typical questions that may be addressed. In this regard, it is apparent that the type of information that would be useful in preparing a request for tenders to build a 200 megawatt electricity plant in a specific location would be very different from the information needed to prepare a national communication.

TABLE 2. ILLUSTRATIVE DECISION-MAKING LEVELS AND TYPICAL TECHNOLOGY QUESTIONS

Level of decision-making	Possible decision makers	Typical questions
Cross-sectoral/ regional	Interministerial Committee	What should be the national expenditure for energy and agriculture?
Sectoral	Minister	Which policies and technologies are needed to achieve national goals?
Programme	Deputy Minister/Regional Administrator/ Senior Corporate Executive	What technologies are available to achieve regional or corporate objectives?
Project	Senior Corporate Executive/Municipal Official	Which particular projects or facilities will provide the highest return for an investment?
Facility	Plant Manager	What motors should be purchased and from which vendor?

C. Types of reports

23. Should any particular sectors, as, for example, energy, industry, transport, agriculture, forestry, or waste management, be given priority in future assessments? Should the reports be of a particular type, for example, case studies? Given the request of the COP to the Convention secretariat to prepare documents for consideration at regular intervals (each interval not to exceed a year), should these reports be very broad or should a series of reports that focus on specific topics be developed over the next several years?

D. Adaptation technologies

24. This report and the note prepared by the secretariat on transfer of technology (FCCC/SBI/1996/5) contain relatively little information on adaptation technologies. This may be partially due to a lack of understanding over what constitutes an adaptation technology or process and as such is a fundamental problem that may be solved if categories of adaptation technologies and processes could be developed and elaborated upon. The SBSTA may wish to consider whether this aspect of the request to the secretariat under decision 13/CP.1 would initially benefit from consideration by the intergovernmental technical advisory panel, should one be established, or the IPCC. The SBSTA may also wish to refer to the provisional tasks identified in FCCC/SBSTA/1996/2.

E. Research and development

25. Technologies that are in the research and development (R&D) stage represent one form of "innovative" technology, although other technologies may also fall into this category. Information on technologies that may emerge from R&D laboratories could be useful for a number of purposes, for example, in mathematical models that develop national scenarios of future emissions or to guide international R&D priorities. In some cases, however, information on technologies in the R&D stage may be difficult to obtain because it is considered proprietary or simply has not been published in the literature available to the public. Nevertheless, considerable information could be assembled, and Parties may wish to consider whether this aspect of the technology assessment should be undertaken by either the intergovernmental technical advisory panel, should one be established, or the IPCC.

V. FURTHER WORK

26. There was relatively little time for many Parties and intergovernmental organizations to respond to the request by the secretariat for information on technology. The secretariat believes that many other valuable reports and information sources exist and could be made available to the Parties, given additional time. It therefore encourages Parties or intergovernmental organizations to forward existing materials to the secretariat as well as providing new information as it becomes available. (It would be desirable for the secretariat to receive technology information routinely to serve as a basis for future reports.) The secretariat will revise its technology database, improve the presentation, provide a regularly updated compilation of information to the SBSTA, and draw up a long-term work programme. (See also FCCC/SBI/1996/4).

27. The secretariat notes that considerable interest exists in finding approaches to promote the diffusion and commercialization of innovative and environmentally sound technologies. A number of approaches are identified in the note by the secretariat on policies and measures (FCCC/AGBM/1996/2). Since technology penetrates the market at different rates due to many factors, it may be useful for the Parties to have information on specific technologies to support future consideration of this issue.

28. In the future, the work of the secretariat in inventorying and assessing technologies would be related to the tasks undertaken by an intergovernmental technical advisory panel dealing with technologies, once established. Indeed, some aspects of the inventory and assessment process as has been indicated above, may benefit from groundwork by such a panel. In other cases, reports prepared by the secretariat could be sent to the panel for technical comments.

29. Currently, the secretariat provides information on the World Wide Web (at the address http://www.unep.ch/iucc.html), including access to official UNFCCC documents that have been developed by the secretariat, and other relevant reports. The "home page" of the secretariat on the World Wide Web also provides direct links to other organizations that have World Wide Web sites. For example, it provides a direct link to the GREENTIE technology database of the IEA. These activities are currently supplementing the more usual transfer of information through documents prepared for sessions of the bodies of the Convention. This facility will be improved during 1996 as part of an overall upgrading of the information outreach activities of the secretariat. The secretariat will make its technology inventory database available through this means, as well as in hard copy, and will develop direct links, as time permits, with other "web sites" to assist Parties to obtain technology information as rapidly as possible.

30. The secretariat has not yet addressed the issue of "elaboration of the terms" referred to in decision 13/CP.1. An initial treatment of this issue will be undertaken in a future report. The secretariat has begun to collect information on global financing requirements for key sectors over the next few decades and options to meet these needs.

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